MHF4U Name _____

Unit 4 – Characteristics of Functions

Expectation	Level Achieved
D1 - demonstrate an understanding of average and instantaneous rate of change, and determine, numerically and graphically, and interpret the average rate of change of a function over a given interval and the instantaneous rate of change of a function at a given point	

1. Find the rate of change of Pete's height from 3 to 5 years. What does this mean about Pete?

Time (years)	1	2	3	4	5	6
Height(in.)	27	35	37	42	45	49

2. Suppose that the weight in grams of a cancerous tumor at time t is $W(t) = 0.1t^2$, where t is measured in weeks.

a) What is the instantaneous rate of growth of the tumor (in grams per week) when t = 5?

b) At what time is the tumor growing at the instantaneous rate of 5 grams per week?

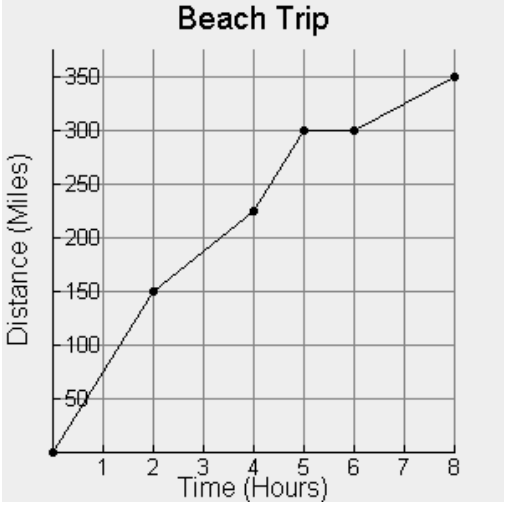
3. After an advertising campaign, the sales of product often increase and then decrease. Suppose that t days after the end of advertising, the daily sales are $-3t^2 + 32t + 100$ units.
a) At what rate (in units per day) are the sales increasing when t = 2?

b) When will sales be increasing at the rate of 2 units per day?

4. In 1990, the value of a prized collector's coin was $12,500. In 2009, the value of the coin is $20,050. What is the average annual rate of change?

MHF4U Name _____

5. The graph below shows the distance a family travels on a trip to the beach versus the time it takes to get there.



a. What is the average rate of change in distance over the entire trip?

b. What is the average rate of change in distance between the 2^{nd} and 4^{th} hour?

between the 4^{th} and 5^{th} hour?

between the 5^{th} and 6^{th} hour?

between the 6^{th} and 8^{th} hour?

c. Are the average rates of change in the above intervals the same? Explain why or why not.

MHF4U Name _____

Expectation	Level Achieved
D2 - determine functions that result from the addition, subtraction, multiplication, and division of two functions and from the composition of two functions, describe some properties of the resulting functions, and solve related problems	

If $f(x) = 3x^2 - 5x + 10$ and $g(x) = 9x + 1$, find the following

a) $f(x) + g(x)$
b) $f(x) \bullet g(x)$
c) $f(g(x))$
d) $g \circ f(x)$

State the domain and range of each combined function above.

Expectation	Level Achieved
D3 - compare the characteristics of functions, and solve problems by modelling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques.	

1) $\sin x = x$
2) $2x + 9 = 5^x$
3) Describe and sketch a function for which the average rate of change would be twice the instantaneous rate of change for the entire function.
4) Describe and sketch a function for which the instantaneous rate of change is negative when x is positive and for which the AROC is positive when x is negative.